

problem solutions

705 ELECTRONIC DATA-PROCESSING MACHINE

ACTUAL AND AUTOCODER PROGRAMMING

Form 22-6732-0

PROBLEM 1. INPUT-OUTPUT (Tape to Card)

	C 2 S Emp. No.		2 8 No.	0 7 3	0 0 EIW. T.	4 9180		0 2 # ate 61 80							
$\begin{bmatrix} 2 & 0 & 2 \end{bmatrix}$	$\begin{bmatrix} 0 \end{bmatrix}$	Y 0 8 0 0	2 0	3 0 0			0 0	1 0 0	0	4					
SInstr.	0004	Instr. 2	Inst	r. 0014	Instr 4	•	0019	Instr 5	•	0024					
01		02		03		04		05		06	07			08	3
09		10		11		12		13		14		1	5		
INSTR.	OPER	STRUCTION R. ADDRESS	STOR.	ACCUMULA	TOR 00	SIGN		UXILIARY RAGE 01-15	SIGN		EXPLANATIO	И			
0004	SEI	0200								Select tape u	nit 1				
0009	RD	0800								Read tape re		me	mo	ry	
0014	SEI	0300								Select card p					
0019	WR	0800	00							Punch record	l in card				
0024	TR	0004								Transfer to s	start.				

PROBLEM 2. INPUT-OUTPUT (Card to Tape)

J G 4 3 -	4 G A S K E T b b b b b b	b b 0 1 5 9 7	7 5 0 4 0 0 1 0	3 ‡
Part No.	Description	0 0 0 0 0 0 0	0	6033
2 0 1 0 0 Y 6	0 0 1 2 0 2 0 0 R 6 0 0 1	1 0 0 0 4		

01		02	ļ	03)4	05		06	07	08					
									i							
09		10	1	11		12	13		14	<u> </u>	5					
INSTR.	INSTR	UCTION	STOR.	ACCUMUL	ATOR OG	Z	AUXILIARY	Z			<u> </u>					
LOCATION	OPER.	ADDRESS	CODE	ACCOMOL	ATOR OU	SIG	STORAGE 01-15	SIGN		EXPLANATION						
0004	SEL	0100						П	Select card re	eader 1						
0009	RD	6001				T										
0014	SEL	0200						\top	Read card into memory Select tape unit 1							
0019	WR	6001	00					Write record on tape								
0024	TR	0004						Transfer to start.								

PROBLEM 3. INPUT-OUTPUT

Ј ОН	N b A	DA MS	b b	b b b b 1	3	5 9 6 7 0	0	0 1 3 5 9 ‡
11001	Name		-	016 Cu	sto	omer 87011 ber 11		Amount S S S
INSTR. LOCATION	OPER.	ADDRESS	STOR. CODE	ACCUMULATOR 00	SIGN	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION
0004 0009	SEL RD	0100 11001						Select card reader 1
0014	SEL	0200			\dashv	· · · · · · · · · · · · · · · · · · ·	H	Read card into memory Select tape unit 1
0019	WR	11001	00					Write complete record on tape
0024 0029	SEL WR	0400 11017	00		-			Select printer 1
0034	TR	0004	VU					Print partial record on printer Transfer to start.

Note: For greater visual clarity, memory addresses are expressed here as 5 digit fields. Note, however, that where the memory position is above 9999 the high order position becomes an alphabetic character. Therefore, memory position 15742 is converted into 5742 with 01 zoning over the 5. A 5 with 01 zoning over it is identical to a V, and the address may be expressed as V742 although designating the appropriate zoning over the numeric figure is preferable. Memory position 24733 (in Model II which has 40,000 positions of memory) becomes 4733 with 10 or minus zoning over the 4, i.e. M733.

PROBLEM 4. ADDITION

b 0 5	8 2 3 1	009	4 8	1 7 b b b	b	b b b ‡						
0006	A 8	P I	3	9013	Т	9020	•					
INSTR. LOCATION	INSTRU OPER.	JCTION ADDRESS	STOR. CODE	ACCUMULATOR 0.0	SIGN	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION				
0004	SEL	0200						Select tape unit 1				
0009	RD	9001						Read record into memory				
0014	RAD	9006	00	a058231	+			Reset add factor A				
0019	ADD	9013	00	a0153048	+			Add factor B to produce T				
0024	ST	9020	00	a0153048	+	· ·		Store T in memory				
0029	SEL	0201			П		Select tape unit 2					
0034	WR	9001	00					Write record on tape				
0039	TR	0004						Transfer to start.				

PROBLEM 5. ADDITION/SUBTRACTION

	8 2 A 1	1 1 0 5 Base Pay	80	9 2 5 1 3 T. 7000 ay 001	<u>. </u>	7	1 8	b Net Pay		10013	10014 +++
									T	Ì	
INSTR.	INSTRU OPER.	ADDRESS	STOR. CODE	ACCUMULATOR	00	SIGN	AUXI STORAC		15	SIGN	EXPLANATION
0004	SEL	0200								_	Select tape unit 1
0009	RD	9990									Read record into memory
0014	RAD	10000	06				a1105	0		+	Reset add base pay
0019	ADD	10004	06				a1197	5		+	Add overtime pay
0024	SUB	10008	06				a1020	0		\pm	Subtract deductions
0029	ST	10013	06				a1020	0		±	Store net pay
0034	SEL	0201									Select tape unit 2
0039	WR	9990	00								Write record on tape
0044	TR	0004									Transfer to start.

PROBLEM 6. MULTIPLICATION

b 0 2	3 4 8 5	9990		b b b b	b k	b	, [‡]																
30498 905 907 907 907 907 907 907 907 907 907 907	, ,	30504 B 30507	• •	P		0	17																
INSTR.	OPER.	ADDRESS	STOR. CODE	ACCUMULATO	R 00	SIGN		XILIARY AGE 01-	15	EXPLANATION													
0004	SEL	0205								Select input tape unit													
0009	RD	30499									Read												
0014	RAD	30504	00	a023489		+					Reset										r		
0019	MPY	30507	00	a0232541	.10	+					Multip	oly	by	B	(to	ta	l h	ou	rs)			
0024	ST	30516	00	a0232541	10	+					Store	pro	odu	ct	in	m	em	101	·у				
0029	SEL	0202						•		Store product in memory Select output tape unit													
0034	WR	30499	00								Write	re	COI	rd	on	ta	рe						
0039	TR	0004									Trans	fer	·tc	st	ar	t.						 	

PROBLEM 7. MULTIPLICATION

4 F 9	7 1 J	1 3 9	0 2	9 3 8 2 7	b	b b b b b	b	b b b b b b +
D Part No.	9060	Qty S	Unit Cost	: £ As 5		Qty. & & Req. & &		Total & E & Cost & C & C & C & C & C & C & C & C & C &
INSTR.	OPER.	ADDRESS	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION
0004	SEL	0200						Select tape unit 1
0009	RD	0901						Read record into memory
0014	RAD	0910	00	a0139	+			Reset add assemblies required
0019	MPY	0917	00	a003753	+			Multiply by qty, per assembly
0024	ST	0923	00	a003753	+			Store result in memory
0029	MPY	0915	00	a00011026314	+			Multiply by unit cost
0034	RND	0001	00	a0001102631	+			Round and 1/2 adj. one place
0039	SET	0007	00	a 1102631	+			Adjust acc. to 7 positions
0044	ST	0930	00					Store result
0049	SEL	0201						Select tape unit 2
0054	wr	0901	00					Write record on output tape
0059	TR	0004		<u></u>				Transfer to step 0004.

PROBLEM 8. PARTIAL PAYROLL PROBLEM

JOHN	bJ.	b D O	E b	b b b b 0 1				2
9015	Name			00 Dp	9032	880 Kate 6	H W	r 6
b b b t	b b =		1 3	$0 \overline{0} 1 \overline{8} $				
Net Pay	9060 9061		OExe	nt 6 6				
INSTR.	OPER.	ADDRESS	STOR. CODE	ACCUMULATOR 00	SIGN	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION
0004	SEL	0200						Select input tape unit
0009	RD	9015						Read record into memory
0014	RAD	9040	00	a425	+		┖	R add hours worked-multiplier
0019	MPY	9037	00	a0657475	+		L	Multiply by rate per hour
0024	RND	0002	00	a06575	+		\perp	Round
0029	ST	9055	00	a06575	+		_	Store gross pay
0034	RAD	9033	00	a3	+		ļ.	R add tax class
0039	MPY	9503	00	a03900	-		\perp	Multiply by exemption amount
0044	ADD	9055	00	a02675	+		_	Add gross = taxable amount
0049	MPY	9505	00	a0048150	-		_	Multiply by 18%
0054	RND	0002	00	a00482	-		\perp	Round
0059	ST	9050	00	a00482			\perp	Store current withholding tax
0064	ADD	9055	00	a06093	+		_	Add gross pay
0069	ADD	9045	00	a05073	+			Subtract deductions = net pay
0074	ST	9060	00	a05073	+		\perp	Store net pay
0079	SEL	0201			Ш		\perp	Select output tape unit
0084	WR	9015	00					Write record on tape
0089	TR	0004					_	Transfer to start.

PROBLEM 9. DIVISION

00	3 0 8 4	C- 0	bb	b b	1	15																		
276	A	2760 B) - 1	Q	- 1	$\frac{276}{276}$																		
											Ī									T			T	
INSTR. LOCATION	OPER.	ADDRESS	STOR. CODE	ACCUA	MULAT	OR 00	SIGN	UXILI RAGE	ARY 01-15	N.C.	5						EX	PLA	NAT	101	1		 	
0004	SEL	0200					П				_	Sele	et i	np	nut	ta	pe	u	nit					
0009	RD	27601										Reac									שיינ	,		
0014	RAD	27607	00	a2130	841		+					Rese												
0019	DIV	27609	00	a3180)3		+]	Divi	de i	by	В								 	
0024	RND	0001	00	a3180)		+)	Rour	nd											
0029	SET	0006	00	a0031	180		+				Т	Set]		t. 6	3 n	la	ce	8						
0034	ST	27615	00	a0031	180		+					Stor				=55	-							
0039	SEL	0201									_	Sele			pu	t t	an	e ı	uni	it				
0044	WR	27601	00								- 1	Writ			_		_				ta	pe	 	
0049	TR	0004									- 1	Trar												

PROBLEM 10. DIVISION

0 3 2	6 1 5	1 1 0 0	9 0	ф b b	b ‡																	
SPart No.		Qty.	Qty.	1297	1300 1301																	
INSTR.	OPER.	ADDRESS	STOR. CODE	ACCUMULA	TOR 00	SIGN	XILIAR	SIGN							EXI	PLAI	TAP	ОИ				
0004	SEL	0200							Se	lec	t i	np	ut	ta	pe	ur	it					
0009	RD	1285				Ш	 	 ı	Re									رمه	cy_			
0014	RAD	1297	00	a900		+		 1	\mathbf{R}										•	nd		
0019	SET	0004	00	a0900		+			Pr		_	-			-							
0024	LNG	0004	00	a09000	000	+		i i	Le	•												
0029	DIV	1294	00	a8181		+		- 1	Di	_			6_a	cc	ep	te	<u>1</u>					
0034	RND	0001	00	a818		+			Ro						•							
0039	ST	1300	00						Sto	ore	%	a	cce	ent	ed							
0044	SEL	0201				\square		 _	Se	lec	et c	out	pu	<u>t t</u>	ap	e u	mi	t				
0049	WR	1285	00			ot	 		W	cite	e r	ec	or	d o	on	ou	tpı	it 1	ap	е		
0054	TR	0004			,		 		Tr	an	sfe	r	to	st	ar	<u>t.</u>						

PROBLEM 11.

Ме	mory	Accumulator Before	Acc. Sign	Accumulator After	Acc. Sign.	
ADD	3265	a55	+	a320	+	
	b79 +	a33	+	a112	+	Overflow Check Ind.
	A650	a320	-	a330	+	Sign Check Ind.
SUB	63276	a200	+	a076	-	
	b38	a38	+	a00	+	Sign Check Ind.
	A87	a14	-	a101	_	Overflow Check Ind.
R ADD	[†] 3721	a0	+	a721	-	
	$AB12\overset{+}{4}$	a91	-	a124	+	
	b318	aCA4	-	a318	+	Sign Check Ind.
R SUB	A127	a0	+	a127	_	Sign Check Ind.
	6322	a1279	_	a322	+	
	1837653	a6273	+	a837653	_	
MPY	+ + 525	a4	+	a100	+	
	b330	a02	-	a00660	_	Sign Check Ind.
	+- 55	a6	-	a30	+	
DIV	$\overset{+}{2}\overset{+}{2}\overset{+}{2}$	a088	-	a4	-	
	b20 [†]	a600	+	a0	+	Overflow and
	+				*	Zero Ind.
	A5	a0295	+	a059	+	
STORE	37298	a22	-	Memory After 37222		
	$6\overline{4}5\overline{2}\overline{1}$	a321	+	65321		
	ABC215	a216	+	ABC216		

PROBLEM 12. LOAD/COMPARE

B 9	7 6 5	3 2 7 0 3	7 5 0 ‡	J - 1 2 3	3	
19541	19545	19458	19553 19554	13000	# 0000 T	

J-12	3											
01		02		03		04		05		06	07	08
09		10		11		12		13		14	1:	5
INSTR. LOCATION	OPER.	UCTION ADDRESS	STOR. CODE	ACCUMUL	ATOR 00	SIGN		IXILIARY AGE 01-15	15 EXPLANATION			
0004	SET	0005	01				a000	000	+Housekeeping			
0009	LOD	13004	01				aJ-1	23		Load the cons		ber
						Ц			1			
									-			
		 				Н			+			
0014	SE L	0200							+	Sel input tape	unit	
0019	RD	19541								Read tape rec		
0024	CMP	19545	01							Compare cons		ord
0029	TRH	0044								Constant high		
0034	TRE	0059								Constant equa		
0039	HLT	0001								Constant lowe	r than record	
0044	SEL	0201								Sel output tap	e unit	
0049	WR	19541	00							Write record	on tape	
0054	TR	0014								Transfer to s	tart	
0059	SEL	0400								Sel printer		
0064	WR	19541	00							Write the rec	ord on printe:	r
0069	TR	0014								Transfer to s	tart.	

PROBLEM 13. SEQUENCE CHECK

3	4 5 6	+ 7	0 1	2	0	0 0	0	0	8	0 0	b	b	b	b	b	‡										
		35504				9 7 1 0				2 5 7 1 7					35520	35521									 	
										T	Γ									T						

								a00000)				
01		02		03		04		05		06	07	08	
1													
09		10	<u> </u>	11		12		13		14	1	5	
INSTR. LOCATION	OPER.	ADDRESS	STOR. CODE	ACCUMULA	ATOR 00	SIGN		IXILIARY IAGE 01-15	SIGN		EXPLANATION	<u> </u>	
0004	SET	0005	05				a000	00	+	Prepare ASI	I 5		
0009									П	110pa10 1100	, ,		
									\Box				
0034	SEL	0200							П	Input tape un	it		
0039	RD	35500								Read record into memory			
0044	CMP	35504	05		_		a000	00	+	Comp part no. to previous			
0049	TRH	0109							П	Part no. out of sequence			
0054	TRE	0109								Part no. out			
0059	LOD	35504	05				a345	67	+	Load part no	for next c	omp.	
0064	RAD	35510	00	a012000)	+				Total cost			
0069	SET	0009	00	a0000120	000	+				Adjust divide	end		
0074	LNG	0002	00_	a0000120	00000	+			П	Adjust divide			
0079	DIV	35515	00	a001500	<u> </u>	+				Div by qty fo			
0084	RND	0001	00	a00150		+				Adjust quotie			
0089	ST	35520	00							Store unit co	st		
0094	SEL	0201				[Select output	tape		
0099	WR	35500	00							Write record	l ·		
0104	TR	0034								Tr to start			
0109	SEL	0400								Select printe	r	· · · · · · · · · · · · · · · · · · ·	
0114	WR	35500	00						Write record				
0119	TR	0034							Tr to start.				

PROBLEM 14. END OF FILE

G/M											
01		02	<u> </u>	03)4	05		06	07	08
09		10	+	11	1	12	13		14		5
INSTR. LOCATION	OPER.	ADDRESS	STOR. CODE	ACCUMUL		Z A	UXILIARY DRAGE 01-15	SIGN		EXPLANATION	
0004	SET	0001	01				a0	+			
0009	LOD	0180	01				a^{\ddagger}	+			
0014	UNL	19022	01				a‡ a‡	+			
0034	SEL	0200						$\parallel \parallel$	Input tape		
0039	RD	19000]			Read record		
0044	TRS	0094							To end of file routine		
0049	RAD	19013	00	a0050		+		П	Unit cost		
0054	MPY	19009	00	a000062	50	+		П	x quantity =	total cost	
0059	ST	19021	00						Store total co	ost	
0064	SEL	0201							Output tape		· · · · · · · · · · · · · · · · · · ·
0069	WR	19000	00					П	Write record	i	
0074	TR	0034							Transfer to	main routin	е
0094	RWD							H	Rewind input	tape	,
0099	SEL	0201							Output tape		
0104	WTM								Tape mark o	output tape	
0109	RWD							Rewind output tape		-	
0114	SEL	0500				_		Typewriter			
0119	WR	0156	00				· · · · · · · · · · · · · · · · · · ·	Message to operator.			
0124	HLT	0001				T					

PROBLEM 15. END OF FILE

G/M													
01		02		03	0	4		05		06	07	08	
	!												
09	-	10	 	11	1	2		13		14		15	
INSTR.		UCTION	STOR.	ACCUMULA		SIGN		ILIARY	SIGN		EXPLANATION		
LOCATION	OPER.	ADDRESS	CODE	Accomod	10000	Š	STORA	GE 01-15			EXPLANATION		
0004	SET	0001	01			_	<u>a0</u>		+	· · · · · · · · · · · · · · · · · · ·			
0009	LOD	2000	01			4	a [‡]		+	Group mark			
0014	UNL	12092	01			4	a‡		+	Put G/M in o	utput record	i	
				ļ		4			Ш				
						+							
	SEL	0200								Input tape			
0039	RD	12073								Read record			
0044	TRS	0099								End of file			
0049	RAD	12084	00	a076325	i	+				R add year to date issues			
0054	SET	0007	00	a007632	5 -	+				Adjust dividend			
0059	DIV	12086		a38162	-	+				Ytd issues ÷ mo. = mo. usage			
0064	ST	12091	00	a38162]-	+				Store result			
0069	SEL	0201								Output tape			
0074	WR	12073	00							Write record			
0079	TRS	0129								End of file			
0084	TR	0034											
	RWD									Rewind input	tape		
	SEL	0201							\square	Output tape			
	WTM				_					Record TM o	utput tape		
0114	RWD									Rewind outpu	t tape		
0119	HLT	9999								End of job			
0129	WTM	 				+			H	Record TM or	utnut tane		
	RWD					1			$ \cdot $	Rewind output			
	HLT	0001				+			H	End of tape,		-001	

 ${\tt PROBLEM}\ 16.$ RECEIVE AND TRANSMIT USING ACC. 00

INSTR.	INSTRU	ICTION	STOR.	ACCUMULATOR 00	Z	AUXILIARY	SIGN	FYRIANIATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMOLATOR OU	š	STORAGE 01-15	š	EXPLANATION
0004	SET	0001	01			a0	+	Prepare ASU 01
0009	LOD	1505	01			a≢	+	Group mark
0014	UNL	12060	01			a‡	+	Put group mark in output record
-							$\!$	
-					-		H	
0034	SEL	0200						Input tape unit
0039	RD	6000						Read record
0044	RCV	11564						Designate output area
0049	TMT	6004	00					Transmit to output area
0054	SEL	0201						Output tape unit
0059	WR	11560	00				П	Write record
0064	TR	0034						Tr to start of main routine.

 $\mbox{{\tt PROBLEM}}$ 17. RECEIVE AND TRANSMIT USING ASU 01-15

INSTR.	INSTRU	ICTION	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY	z	
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR OU	SIC	STORAGE 01-15	SIGN	EXPLANATION
0004	SET	0004	04			a0000	+	Prepare ASU 04
0009	SET	0007	07			a0000000	+	Prepare ASU 07
0014	SET	0001	01			a0	+	Prepare ASU 01
0019	LOD	0905	01			a [‡]	+	Group mark
0024	UNL	6227	01			a [‡]	+	Put G/M at end of output area
	SEL	0200						Input tape unit
0069	RD	1017						Read record
0074	RCV	6212						Designate output field C
	TMT	1028	04					Transmit field C
0084	TMT	1017	04					Transmit field A
0089	TMT	1021	07					Transmit field B
0094	SEL	0201						Output tape
0099	WR	6212	00					Write record
0104	TR	0064					Tr to start of main routine	

PROBLEM 18. RECEIVE AND TRANSMIT

INSTR.	OPER.	JCTION ADDRESS	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION
0004	SET	0004	06			a0000	+	Prepare ASU 06
0009	SET	0001	07			a0	+	Prepare ASU 07
0014	LOD	10000	07			a [‡]	+	Group mark
0019	UNL	5065	07			a [‡]	+	Put G/M at end of output record
0024	UNL	19370	07			a‡	+	Put G/M at end of variation record
0029	SET	0005	05			a00000	+	Prepare ASU 05
0099	SEL	0200						Input master tape
0104	RD	16035						Read record
0109	SEL	0202						Input variation tape
0114	RD	19361					Ц	Read record
0119	LOD	19365	05			a32561	+	Load employee no.
0124	CMP	16039	05			a32561	+	Comp employee numbers
0129	TRE	0154						Transfer on equal
0134	TRH	0164						Transfer on high
0139	SEL	0500						Select typewriter
0144	WR	19361	00					Write variation record
0149	TR	0099						Transfer
0154	RCV	16040						Designate master rate field
0159	$\mathbf{T}\mathbf{M}\mathbf{T}$	19366	06					Transmit rate
0164	RCV	5054						Designate output work area
0169	TMT	16039	00					Transmit master record
0174	SEL	0201						Select output tape
0179	WR	5050	00					Write record
0184	TR	0099						Transfer to start.

PROBLEM 19. READ WHILE WRITING

INSTR.		UCTION	STOR.	ACCUMULATOR 00	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS		<u>~</u>	STORAGE 01-15	2	
0004	SET	0001	01		a0	+	Prepare ASU 01
0009	LOD _	1505	01		a‡ a‡	+	Group mark
0014	UNL	12060	01		a‡	+	Group mark Put G/M in output record
0019	SEL	0200					Input tape unit
0024	RD	6000					Read first record
						H	
0034	RCV	11584				\prod	Designate output work area
0039	TMT	6004	00				Transmit to output work area
0044	SEL	0200				\prod	Input tape unit
0049	RWW	6000					Prepare to read while writing
0054	SEL	0201					Output tape unit
0059	WR	11580	00				Read and write simultaneously
0064	TR	0034				Transfer to main routine.	

PROBLEM 20. READ WHILE WRITING

G/	M				<u> </u>							
01		02	<u> </u>	03)4		05		06	07	08
09		10		11		12		13		14		15
INSTR. LOCATION	1	ADDRESS	STOR. CODE	ACCUMULA	ATOR 00	SIGN		JXILIARY RAGE 01-15	SIGN		EXPLANATION	
0004	SET	0003	12				a00	0	+	Prepare ASU	12	
0009	SET	0005	13				a00	000	+	Prepare ASU 13		
0014	SET	0006	14				a00	0000	+	Prepare ASU 14		
0019	SET	0001	01				a0		+			
0024	LOD	2005	01				a‡		+			
0029	UNL	15088	01				a [‡]		+	<u> </u>		
0034	SEL	0200								Input tape		
0039	RD	1000								Read first re	cord	
0084	RCV	15063								Designate pa	yroll no. ou	tput
0089	TMT	1000	12							Transmit pay		
0094	RCV	15068								Designate en		
0099	TMT	1003	14							Transmit em	p. no. to ou	itput
0104	RCV	15076								Designate ins	s. output	
0109	TMT	1009	13							Transmit ins		
0114	RCV	15083								Designate ad	v. output	
0119	TMT	1014	13							Transmit adv	to output	
0124	SEL	0200								Input tape		
0129	RWW	1000							Prepare to read while write		rite	
0134	SEL	0201							Output tape			
0139	WR	15063	00				R/W		R/W simulta	neously		
0144	TR	0084					Transfer to main routine.					

PROBLEM 21. Page 1 of 2

	Memory	Acc. Storage Before	Acc. Sign	Acc. Storage After	Acc. Sign	Check Indicators
ADD	+ + 6573	a61	-	a512	+	
	b82V	a134	+	a959	+	Sign Check
	+ - 62243	a3765	+	1522	+	
SUB	A827	a28	-	a855	-	Sign Check
!	7376	a12781	+	a12405	+	
	73274	a3274	_	a0000	+	
R ADD	b83S	a 72 15	-	a832	+	Sign Check
	K3 7 5	a16	+	a375	+	
	54381	a9654	+	a381	-	
R SUB	421	a521	+	a21	+	
	b538X	a151	-	a387	-	Sign Check
	53743	а9	+	a3743	-	
MPY	 560	a5	_	a300	+	
	D120	a003	+	a000360	+	
	b15	a325	-	a04875	-	Sign Check
DIV	+ + 765	a70	+	a 7 0	+	Zero Indicator
	b5	a075	+	a15	+	
	b_{5}^{\dagger}	a75	+	a0	+	Overflow and Zero Check
	A9	a81	+	a9	+	Sign Check
LOAD	A36	a9	_	a6	+	
	DOEbJ	a65431	+	aDOEbJ	+	
	563AB5	a32761	+	a63AB5	+	

PROBLEM 21. Page 2 of 2

	Accumulator Storage	Acc. Sign	Memory Before	Memory After
STORE	a37	-	$6\overset{+}{4}338\overset{+}{2}$	+ + - 643337
	a37982	+	+ + + A65213A	A637982
	a21	+	DOEb15	DOEb2
	a7	-	bA76532	bA76537
UNLOAD	a219	+	bAB5600	bAB5219
	aDOEbJ	+	DOEbM56	DODOEbJ
	a15	_	7 [†] 77B4681	+ - 77B4615

Instr	ruction	Accumulator Storage Before	Acc. Sign	Accumulator Storage After	Acc. Sign
SHOR	0001	a3976	+	a397	+
LENG	0002	a7653	+	a765300	+
SHOR	0002	a375	-	a3	-
LENG	0000	a5762	+	a5762	+
SET L	0004	a006512	+	a6512	+
SET L	0005	a372	_	a00372	-
ROUND	0001	a796	+	a80	+
ROUND	0003	a37352	+	a37	+
ROUND	0004	a68712	_	a7	_

PROBLEM 22. PAYROLL Page 1 of 2

INSTR.		JCTION	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMODATOR OU	Si	STORAGE 01-15		EXPLANATION
0004	SET	0001	01		Ш	a0	+	
0009	LOD	1013	01		Ц	a [‡]	+	Group mark
0014	UNL	12061	01_		Ш	a‡	+	Put G/M in output record
0019	SET	0004	02		Ц	a0000	+	4 zeros for no w. h.
0024	SET	0003	03		Ш	a000	+	3 zeros for no FICA
0029	SEL	0200						Input tape
0034	RD	1150						Read first record
								Transmit record to output area
0039	RCV	12024					П	Designate output area
0044	TMT	1154	00		П			Transmit to output area
					П		\sqcap	
					П		$\dagger \dagger$	Test for withholding tax
0049	RAD	12027	00	a5	+		П	Tax class
0054	MPY	1003	00	a06500	_		\sqcap	Tax class x 13.00 = exempt. amt.
0059	ADD	12048	00	a12075	+		Ħ	Gross - exmpt. amt. = tax gross
0064	TRP	0079	00				\sqcap	To cale, withholding tax
0069	ST	12052	02				\Box	No withholding tax - put 4 zeros
							H	in output
0074	TR	0104			Н		$\dagger \dagger$	To test for FICA
							TT	
	· - · · · · · · · · · · · · · · · · · · ·						TT	Calc. withholding tax
0079	MPY	1005	00	a0217350	+		Ħ	Taxable amt. x 18% w.h. tax
0084	RND	0002	00	a02174	+		$\dagger \dagger$	Adjust to nearest cent
0089	SET	0004	00	a2174	+		H	Adjust to 4 places
0094	ST	12052	00	a2174	+			Put w.h. tax in output record
0099	ADM	12039	00	a2174	+		+	Adjust y.t.d. w.h. tax
	7115171	12000	- 00				+	Aujust y.t.u. w.n. tax
				****	+		+	Test for FICA
0104	RAD	1012	00	a420000	+		+	42000
0109	SUB	12033	00	a005000	+		+	Y.t.d. gross
0114	TRP	0129	00	450000	-		+	To test for partial FICA
0119	ST	12055	03		\vdash		+	
0119	TR	0179	va		$\vdash \vdash$		++	No FICA - put 3 zeros in output
0124	SUB	12048		-010575	\dashv		+	To calc, net pay
0129	TRP	0149	00	a013575	H	-	+	Gross To full FICA calc.
0.194	INF	0149	UU		Н		++	TO THIT FICA CAIC.
					Н		++	D- 41 L DIGA
0139	ADD	10040	00	a005000	+		╁	Partial FICA cale.
		12048	00	*	-		\vdash	Add back gross
0144	TR	0154					Ш	To multiply by 2%.

 ${\tt PROBLEM~22.~PAYROLL~Page~2~of~2}$

INSTR.		UCTION	STOR.	ACCUMULATOR 00	S	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE		S	STORAGE 01-15	S	
					H		+	Full FICA cale.
0149	RAD	12048	00	a18575	+		H	Gross
0154	MPY	1006	00	a0010000	+		\forall	Gross x 2% = FICA
0159	RND	0002	00	a00100	+		\Box	Adjust FICA to nearest end
0164	SET	0003		a100	+		\Box	Adjust to 3 places
0169	ST	12055		a100	+		$\dagger \dagger$	Put FICA in output record
0174	ADM	12043		a100	+		+ 1	Adjust y.t.d. FICA
0111	110111	12010	- 00	1100	T		\vdash	rajust y. t. u. 11071
								Calc. net pay
0179	RAD	12048	00	a 18575	+			Gross
0184	ADM	12033	00	a18575	+		П	Adjust y.t.d. gross
0189	SUB	12052	00	a 16401	+		П	Withholding tax
0194	SUB	12055	00	a16301	+		П	FICA
0199	ST	12060	00	a16301	+			Put net pay in output record
							Ш	
			~					Write record
0204	SEL	0200					П	Input tape
0209	RWW	1150						Prepare input to read
0214	SEL	0201						Output tape
0219	WR	12020	00					Write record and read simul.
0224	TRS	0284					П	End of output tape
0229	SEL	0200					П	Sel input tape unit
0234	TRS	0344			Т		П	End of input file
0239	TR	0039					П	Transfer to start
0004	TITTA				\sqcup		\sqcup	
0284	WTM				\sqcup		\sqcup	Tape mark on output tape
0289	RWD				Ц		Ш	Rewind output tape
0294	HLT	0001			\sqcup		Ш	Stop
0299	TR	0229			\dashv		Н	Transfer to Sel input tape
0344	RWD				\vdash		\dashv	Rewind input tape
0349	SEL	0201			\forall		$\dagger \dagger$	Select output
0354	WTM	VAVI			\forall		\vdash	Tape mark on output tape
0359	RWD				\dashv		+	
0364	HLT	9999			┝┼		H	Rewind output tape End of job.

PROBLEM 23. DRUM SEARCH

G/M	ſ	a0014	a2	007	a0	00	0				a0000000	
01		02	Ţ	03	()4		05		06	07	08
								a13	;			
09		10		11		12		13		14	1.	5
INSTR. LOCATION	IN: OPER	STRUCTION . ADDRESS	STOR. CODE	ACCUMULA	ATOR 00	SIGN		XILIARY AGE 01-15	SIGN		EXPLANATION	
0004	SET	0001	01				a0		+			
0009	LOD	5016	01				a‡		+	Group mark		
0014	UNL	2190	01				a‡		+	Put G/M at e	nd of record	
0019	RAD	5008	02				a00		+	Constant 0014		
0024	RAD	5004	03				a20		+	Address of fi	rst shop ord	er no.
0029	SET	0004	04				a00	00	+			
0034	SET	0007	07			Ц	a00	00000	+			
	ļ								$\perp \downarrow$			
0039	RAD	5014	13				a13		+	Initialize cou	nter	
0044	SEL	0100				Ш				Card reader		
0049	RD	4001				Ц			11	Read a card		
0054	LOD	4016	04			Ш	a12	06	+			
0059	UNL	0069	04			_			\sqcup	Adjust sel, in		_
0064	UNL	0144	04						\perp	Adjust sel. ii	nstr. for wri	ting
0069	SEL	(1206)							\vdash	Drum section	,	
0074	RD	2001		<u> </u>		-			+	Reading drun		
0079	LOD	4012	07				aOE	7170B	+	Shop order no		
0013	CMP	(2007)	07	 			ugi	CILIOD	╁	To shop orde		
0089	TRE	0119	01	 		-			+-	Shop order no		ii uiii
0094	SUB	5015	13.						\top	Subt. 1 from		
0099	TRZ	0114							\dagger	Have tried 14		
0104	ADM	0084	02						T	Adjust comp.		.
0109	TR	0084							1	To comp next		no.
0114	HLT	0001				Г			\top	Wrong section		
									Τ			
0119	LOD	0084	04				a20	21	+	Address of ed	g. shop orde	r no.
0124	ADD	5012	04				a20	28	+	Address of c		
0129	UNL	0139	04				a20		+	Adjust		
0134	RAD	4021	00	a0941		+				Cost from ca	rd	
0139	ADM	(2028)	00							Adjust cum.		ost
0144	SEL	(1206)								Drum section		
0149	WR	2001	00						Π	Write back or	n drum	
0154	UNL	0084	03						$oxed{oxed}$	Reset comp.	address	
0159	TR	0039								To read anot		

PROBLEM 24. READING PROGRAM INSTRUCTIONS FROM DRUM

INSTR.		JCTION	STOR.	ACCUMULATOR 00			SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMULATOR OU	š	STORAGE 01-15	힑	EXPLANATION
0004	RAD	1533	01			a10	+	Constant 10
0009	RAD	1537	02			a1014	1+	Drum section address
0014	SEL	(1014)					Ш	Drum section
0019	RD	7750						Each group of drum instructions
0024	TR	7754						To program from drum
							Ш	Program from drum
7754	ADM	0014	01				П	Adjust select instruction
								To next drum section to be used
·								
-								
9744	TR	0014						To select and read next drum
								section
								Last drum section
7754	UNL	0014	02					Reset select instruction
							П	to address of first
								drum section used
					Ī			
							П	
					Γ		П	
9744	TR	0014						To select and read 1st drum section.

PROBLEM 25. ERROR CORRECTION ROUTINE

INSTR.	INSTRU	JCTION	STOR.	ACCUMULATOR 00	Z	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMODATOR OU	š	STORAGE 01-15	š	LAIDANATION
0004	SET	0001	01			a0	+	
0009	LOD	5003	01			_a≢	+	Group mark
0014	UNL	6381	01			a [‡]	+	Put G/M at end of record
					H		H	
0029	RAD	5001	03		\vdash	a2	+	Place 2 in ASU 03
0034	SEL	0200						Input tape
0039	RD	6363						Read record
0044	SEL	0902						R/W indicator
0049	TRS	0104						Tr on error
0054	RAD	6374	00	a0120990	+			Commission %
0059	MPY	6367	00	a000483960	+			% x sales amt. = comm. amt.
0064	RND	0002	00	a0004840	+			Adjust to nearest cent
0069	SET	0006	00	a004840	+			Prepare for storing
0074	ST	6380	00	a004840	+			Store result
0079	SEL	0201						Output tape
0084	WR	6363	00					Write record
0089	TR	0029					\perp	Transfer to main routine
					\vdash		+	
0104	SEL	0200						Input tape
0109	BSP							Backspace tape
0114	SUB	5002	03					Counter goes to +1, 0 and -1
0119	TRP	0039	03					To re-read
0124	HLT	0001						3rd read error.

PROBLEM 26. TRANSFER ANY TO DETECT END OF FILE AND READING ERRORS USING NORMALIZE AND TRANSFER COUNTER

INSTR.	INSTR	UCTION	STOR.	ACCUMULATOR 00	Z	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMOLATOR OU	Sic	STORAGE 01-15	$\overline{}$	EXPLANATION
0004	SET	0001	02			<u>a0</u>	+	
0009	LOD	17003	02		L	a≢	+	Group mark
0014	UNL	19106	02			a≢	+	Unload group mark
					L		\sqcup	
0029	SET	0003	03			a000	+	
0034	SEL	0200					Ш	Input tape
0039	RD	19000					Ш	Read record
0044	TRA	0604			L		Ш	0902 - EOF
0049								Main routine
0409	SEL	0400			L		Ш	Printer
0414	WR	19000	00		L		Ш	Write record
0419	TRA	0704			L		Ш	0902 - 0903 - EOF
0424					L			
				Input				
0604	TRS	0624						End of file
0609	SE L	0902			Γ			R/W check indicator
0614	TRS	0634						R/W error
0619	TR	0049						Continue main routine
0624	RWD							Rewind tape
0629	HLT	0001						
0634	SEL	0200					T	Input tape
0639	BSP						T	Backspace
0644	NTR	0039	03				Т	To re-read
0649	HLT	0002						3rd read error
		Ì			Ī		Τ	
							T	
				Output			T	
0704	TRS				T		T	End of page
0709	SEL	0902			Γ		T	
0714	TRS	1			Τ		T	R/W error
0719	SEL	0903			T		T	· · · · · · · · · · · · · · · · · · ·
0724	TRS	1000		<u> </u>	T			P/P error.
0729	TR	0424			T		T	2/1 011011

PROBLEM 27. Page 1 of 2

I. SET

LOD

CMP

TRH

TRE

II. RAD

CMP

TRH

TRE

\mathbf{III}_{\circ}	RAD	4063	XXXXX, XX
	SET	0008	oxxxxx.xx
	LNG	0002	0XXXXXX.XX00
	DIV	4067	XX, XXXX
	RND	0001	XX, XXX
	ST	4072	

- IV. 1. If size of sum is longer than either operand when adding and subtracting.
 - 2. Value of divisor is < or = same number of digits on left side of dividend.
 - 3. Overflow when rounding.

Turn OFF by interrogating 0904 by Sel 0904 and Tr Sig instructions.

V. Store - Moves sign of accumulator with unit digit stored
Operates on only numerical part of characters
Checks position on left of high order digit stored. (If it is a number it is signed plus.)

Unload - Moves characters as they appear Sign of accumulator has no effect.

VI. R Add Non-Numerical character in memory

Read (from tape) Inter-record gap Unload "a" storage mark

Subtract Non-Numerical character and storage mark

Write 00 Group Mark (01) memory position 19999 - 39999

Read (from card) End of card

Store "a" storage mark
Load "a" storage mark
Read (from drum) Drum mark

Compare "a" mark

Multiply "a" storage mark

ADD Memory

(signed field) Non-Numerical character

ADD Memory

(unsigned field) "a" storage mark

Transmit 00 R/M in units position of any five characters transmitted

Transmit 01-15 "a" storage mark

PROBLEM 27. Page 2 of 2

VII. Sum of number of digits in multiplier and multiplicand.

Difference between number of digits in divisor and dividend.

37TTT		
VIII.		a0145638
RND	0004	
	0004	a015
SET	0002	-15
1 176		arə
LNG	0002	a1500
		a 2000
SET LNG	0002 0002	a15 a1500

IX. Tape (Write Status) Reflective Spot
Tape (Read Status) Tape Mark

Card Reader Read Instruction following processing of last card

Printer
Hole in channel 12 of carriage tape
Attempting to read or write off drum

- X. The zone bit structure over the tens and hundreds position of the address.
- XI. Any end of file or check indicator will cause the Tr Any instruction to be effective.
- XII. (a) When an invalid character is sensed when moving characters from memory to the record storage unit.

PROBLEM 28. LOW NUMBER SEARCH

INSTR.	INSTRU	JCTION	STOR.	ACCUMULATOR 00	Z	AUXILIARY	Z	FVDLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR OU	Si	STORAGE 01-15	SIGN	EXPLANATION
0004	SET	0005	00	a00000	+			Prepare accum. 5 positions
0009	LOD	5774	00				Ш	Load first number
0014	CMP	5779	00					Compare first and second number
0019	TRH	0039					\coprod	If first number is high go to 0039
0024	CMP	5884	00					If low number compare to 3
0029	TRH	0059						If number is high go to 0059
0034	TR	0064						If number is low number is found
0039	LOD	5779	00					Load number 2
0044	CMP	5884	00					Compare 2 to 3
0049	TRH	0059						If number 2 is high, go to 0059
0054	TR	0064						If number 2 is low, go to 0064
0059	LOD	5884	00					Load number 3
0064	UNL	9004	00					Unload low number
0069	HLT	0001						Stop machine.

PROBLEM 29. INSTRUCTION MODIFICATION PROBLEM; ADDING 100 FACTORS.

INSTR.	INSTRU	ICTION	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR OU	š	STORAGE 01-15	띩	EXPLANATION
0004	RAD	1904	01			a0003	+	Constant 0003
0009	RAD	1908	02			a0006	+	Constant 0006
0014	RAD	1912	03			a1003	+	Address of first 3 digit total
0019	RAD	1916	04			a1306	+	Address of first 6 digit total
0024	RAD	1920	05			a1300	+	Address of last 3 digit total
1029	UNL	1039	03			a1003	+	Adjust to first 3 digit address
1034	UNL	1044	04			a1306	[+]	Adjust to first 6 digit address
1039	RAD	(1003)	00					3 digit total
1044	ADM	(1306)	00				П	3 digit total and 6 digit total
1049	CMP	1039	05					Comp. address of last 6 dig. total
1054	TRE	1074					П	Continue program
1059	ADM	1039	01					Increase r add address by 3
1064	ADM	1044	02					Increase add mem address by 3
1069	TR	1039						To repeat accumulation
1074								Continue program
					_			
4149	TR	1029			\dashv		H	Repeat program.

 ${\tt PROBLEM~30.}$ Change tape address on end of file

INSTR.	INSTRU OPER.	ADDRESS	STOR.	ACCUMULATOR 00	Ž O	AUXILIARY STORAGE 01-15	SIGN	EXPLANATION
0004	RAD	13069	00	a0201	+	31011402 01-13	S	
0009	UNL	0104		a201	+		$\dagger \dagger$	Initialize input tape unit
0014	RAD	13073	00	a0202	+		\Box	militarine mpu supe uni
0019	UNL	0119		a0202	+		\Box	Initialize output tape unit
0024	SET	0002	02			a00	+	Set ASU 02 two places
							\sqcap	
0104	SEL	(0201)					\Box	Input tape unit
0109	RD	1000						Read record
0114	TRS	0204						End of file
0119	SEL	(0202)						Output tape unit
0124	WR	1000	00					Write record
0129	TRS	0304						End of file
0134	TR	0104					П	
					\perp			
	RWD							Rewind input tape
	IOF							Turn indicator off
	LOD	0104	02			a01	+	Low order position of address
	SUB	13065	02			a05	-	Subt from constant
	UNL	0104	02			a05	-	Unload in Sel address
0229	TR	0119						
	WTM							Tape mark on output tape
	RWD							Rewind tape
	IOF							Turn indicator off
0319	LOD	0119	02			a02	+	Low order positions of address
	SUB	13065	02			a04		Subt from constant
	UNL	0119	02			a04	_	Unload in Sel address.
0334	TR							

PROBLEM 31. NOP/TR SWITCH

INSTR.	INSTRU	ICTION	STOR.	ACCUMULATOR 00	z	AUXILIARY	ΖI	
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR 00	Sign	STORAGE 01-15	SIGN	EXPLANATION
0004	SET	0001	01			a0	+	
0009	LOD	1560	01			a [‡]	+	Group mark
0014	UNL	3034	01			a [‡]	+	
0019	SET	0003	02			a000	+	
0024	SET	0005	03			a00000	+	
				_				
0029	SEL	0200						Input tape unit
0034	RD	3001						Master record
0039	(NOP)	0114						Switch
0044	SEL	0100						Card reader
0049	RD	2021						Change card
0054	LOD	2025	03			a64027	+	Employee no.
0059	CMP	3005	03			a64027	+	Card vs. master
0064	TRH	0104		···			Ш	Tr to set switch
_0069	TRE	0079						Tr to change rate
0074	HLT	0001					Ш	Unmatched card - stop
0079	RCV	3031					Ш	Get rate from card
0084	TMT	2026	02				Ш	Transmit to master
0089	SEL	0201					Ш	Output tape
0094	WR	3001	00					Master record
0099	TR	0029						To read another record
0104	SGN	0035	00	а&	+		Ш	Set switch to B
0109	TR	0089						To write master
							Ш	
0114	SGN	0035	00	a&	+		Ш	&
0119	ADM	0035	00	a&	+		Ц	Set switch to A
0124	TR	0059						To compare.

PROBLEM 32. NOP/TR SWITCH

INSTR.		RUCTION	STOR.		Z	AUXILIARY	Τz	
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR 00	SIGN	STORAGE 01-15	SIGN	EXPLANATION
0004	SET	0001	01			a0	1+	
0009	LOD	1563	01			a	+	Group mark
0014	UNL	4042	01			a‡	+	Put G/M at end of master record
0019	UNL	5034	01			a [‡]	+	- Cord of master record
0024	SET	0004	04			a0000	+	- so of the at the of detail record
					T		†	
0029	SEL	0200						Input tape
0034	RD	4001					T	Read master record
0039	(NOP)	0059						Switch 1
0044	SEL	0202			-		-	Detail input tape
0049	RD	5020						Read detail record
0054	LOD	5023	04		1	aB439	+	Detail product no.
0059	CMP	4004	04			aB439	+	Detail vs. master
0064	TRE	0089					H	
0069	SGN	0069	03		\top	a&	+	Detail = master &
0074	ADM	0085	03		1	a&	+	Set switch 2 to No Op
0079	TRH	0129			+		H	
0084	HLT	0001			+		+	Detail > master
					+		+	Unmatched detail
0089	(NOP)	0109			+		-	Switch S
0094	SGN	0085	03		+	a&	+	Switch 2
0099	ADM	0035	03		$^{+}$	- 0	+	Set switch 2 to Tr
0104	SEL	0201			+	au	+	Set switch 1 to No Op
0109	WR	4001	00		+		\dashv	Output tape
0114	SEL	0201			+		+	Write master record
0119	WR		00		+		+	Output tape
0124	TR	0044		-	+		+	Write detail line
				+	+		+	To read another detail
0129	SGN	0035	03		+-	-	+	
0134	TR	0029			+-	a&	+	Set switch 1 to Tr
					<u> </u>		\perp	To read master,

PROBLEM 33. DIGIT SELECTION; VARIABLE INTERVAL CODE

INSTR.	INSTR	UCTION	STOR.		Z	AUXILIARY	Z	
LOCATION	OPER.	ADDRESS	CODE	ACCUMULATOR 00	Sig	STORAGE 01-15	SIGN	EXPLANATION
		 			\vdash		$\downarrow \downarrow$	
0404	RAD	0910	01		H	a09	+	Codo from to
0409	CMP	0612	01			a09	1	Code from trans, record 01
0414	TRE					403	+	
0419	CMP	0614	01		\dashv		\forall	Sub routine for 01
0424	TRE				+		\vdash	04
0429	CMP	0616	01		\dashv		╁	Sub routine for 04
0434	TRE				+		\vdash	09
0439	CMP	0618	01		-+		\vdash	Sub routine for 09
0444	TRE		01		+		-	26
0449	CMP	0620	01		+		\sqcup	Sub routine for 26
0454	TRE		01		-4		Ц	34
0459	HLT	0001			_			Sub routine for 34
7703	пгт	0001						Unmatched trans. record.

PROBLEM 34. DIGIT SELECTION; UNIFORM INTERVAL CODE

INSTR.	INSTR	UCTION	STOR.	ACCUMULATOR 00	SIGN	AUXILIARY	SIGN	EXPLANATION
LOCATION	OPER.	ADDRESS	CODE	ACCOMULATOR OU	š	STORAGE 01-15	š	EXFLANATION
0004	SET	0004	01			a0000	+	
0009	LOD	0917	01		Ц	a9979	+	Address of first code
227.1		2224			\vdash	-0070	\sqcup	Gat townsfar
0014	UNL	0034	01		\vdash	a9979	+	Set transfer
0019	RAD	0910	00	a 6	1		$\downarrow \downarrow$	Code
0024	MPY	0913	00	a0030	1		Ш	x005
0029	ADM	0034	00		Ц		\sqcup	Adjust pivot address
0034	TR	(10009)						Transfer address
9979	TR							0 sub routine
9984	TR							1 sub routine
9989	TR							2 sub routine
9994	TR							3 sub routine
9999	TR							4 sub routine
10004	TR							5 sub routine
10009	TR		ļ					6 sub routine
10014	TR						Ш	7 sub routine.
10019	HLT_	0001					Ш	8
10024	HLT	0002						9

PROBLEM 35. TABLE LOOK-UP

b 4 4 1060		t		± 6 9 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		7					
0899	0903	0905	6060	0911 0913	0915		0917	0919			
b 1 1	\$ 0 ½	0 8 9 9	5 4	0 1 0	1 0	9	0 1	0 9 1	9		
1001	1002	1008	1010	1012	1014		1018		1022		
					Ĭ .						
01		02		03)4		05		06 07 08	
09		10 UCTION		11		12		13		14 15	
INSTR.		ADDRESS	STOR.	ACCUMULA	ATOR 00	SIGN		JXILIARY RAGE 01-15	SIGN	EXPLANATION	
0004	RAD	1001	00	a11		+			1	Number of items plus one	
0009	CMP	1014	00	a11		+				n to constant one	
0014	TRH	0024	00						L	When n > one	
0019	HLT	0001		0		_			L	If $n = one$	
0024	MPY RND	1002	00	a055_		+			<u> </u>	n x 5	
0029	ST	0001 1001	00	a06 a06		+			-	Round n	
0039	MPY	1001	00	a012		+			\vdash	Store n for next try	
0044	ADD	1008	00	a012		+			-	n x length of items + calculated address = address	
0049	ST	1008	00	a0911		+			+	of first item. Address of fi	mat
0.054	CMP	1018	00	a0911		+				item used to check if search	ie
						T				beyond limits of table	115
0059	TRH	0089	•							To compare against address of	
0004	(TD)									last item	
0064	TRE	0099				\downarrow			Ц	To compare number when	
0069 0074	SGN SGN	1004 1014	01			\dashv	a-		-	Calculated addr. is lower th	an
0079	ADM	 	01			4	a&	····	+	the address of the first item	
$\overline{}$		1004	01			+	a&	7.1.	+	I Tongon II Old Didb	
0084 0089	TR CMP	0004 1022	00			+				TR to recalc. n address	
3355	0.1/11	1022	00			\dashv			Н	Check if search is	
0094	TRH	0134				+		_	\vdash	beyond limits of table	\dashv
0099	UNL	0109	00			\dagger		-	H	To change length to minus Calc. address into load instr	\dashv
0104	SET	0002	00			1			Н	Prepare storage unit	\dashv
0109	LOD	()	00							Item at calc. address	
0114	CMP	1010	00			\perp				Number searched for	\neg
0119	TRH	0134				\downarrow				To change length to minus	
0124	TRE	0159				\downarrow			Ц	Number located	
0129 0134	TR SGN	0069	0.1			4				To change length to plus	
			01			+	a&		+	Change sign of	\Box
	SGN ADM		01 01			+	a-		-	Length field	
0149	ADM		01			+			\dashv	to minus	
	TR	0004	O.L.			+			\dashv	Popost	
										Repeat.	

PROBLEM 36. SALES DISCOUNT PROBLEM (AUTOCODER SOLUTION)

LINE	TAG	OPERATION	NUM.	OPERAND	COMMENTS
007		SET	1	1	
008		LOD	1	(‡)	
009		UNL	1	GM	
010		SET	6	6	
020		LOD	6	(+010000)	
030	RD RCD	SEL		200	
040		RD		SALES RCD	
050		CMP	6	GR SALES	
060		TRH		LODISC	Sales below 100,00
070		TRE		LODISC	
080		RAD		(+03)	
090		TR		CALC	
100	LODISC	RAD		(+02)	
110	CALC	ST		DISC %	
120		MPY		GR SALES	
130		RND		2	
131		SET		5	
140		ST		DISC AMT	
150		RSU		DISC AMT	
160		ADD		GR SALES	
170		ST	<u> </u>	NET SALES	
180		SEL		201	
190		WR		SALES RCD	
200		TR		RD RCD	
210					
220	SALES RCD	DRCD			
230	INV NO		6		
240	DATE		5		
250	CUST NAME		33		
010	GR SALES		6		
020	DISC %		2		
030	DISC AMT		5		
040	NET SALES		6		
050	GM		1		

PROBLEM 37. STORE FOR PRINT (AUTOCODER SOLUTION)

LINE I	TAG	OPERATION	NUM.	OPERAND	COMMENTS
-009 -010	IAG	SET	1 1	1 (.)	COMMENTS
020		UNL	1	OUCOST -4	
030		UNL	1	OVALUE -3	
040		SET	15	30	
050		SET	6	6	
060	MAIN RT	SEL		200	
070		RD		INPUT RCD	
080		LOD	1	(,)	
090		UNL	1	OVALUE -7	
100	:	UNL	1	OVALUE -11	
110		RCV	6	OCODE	
120		TMT	6	ICODE	
130		RCV	15	ODESCR	
140		TMT	15	IDESCR	
150		RAD		IQTY	
160		SPR		OQTY	
170		MPY		IUCOST	To get value
180		RND		1	
190		SPR		OVALUE	
200		RAD		IUCOST	
210		SPR		OUCOST	
220		SEL		200	
230		RWW		INPUT RCD	
240		SEL		201	
250		WR		OUTPUT RCD	
260		TR		MAIN RT	
010	INPUT RCD	DRCD			
020	ICODE		6	1	
030	IDESCR		30	1	
040	IQTY		5		
050	IUCOST		5	1	
060	OUTPUT RCD	DRCD	1		*
070	O CODE		7		
	ODESCR	 	31		
080 090	OQTY		6		
100	OUCOST		7	1	
110	OVALUE		13		
	OVALUE	DCON	1.0		
120	CM	DCON	1	# 1	
130	GM	<u> </u>	1	†	<u>l</u>

PROBLEM 38. ALTERNATOR (AUTOCODER SOLUTION)

LINE	TAG	OPERATION	NUM.	OPERAND	COMMENTS
010	INITIAL	SGN		(-1)	Restore alternator
020		SGN		(-5)	constant to minus
030		ADM		(-5)	
040		ADM		(-1)	
050	RD RCD	SEL		200	
060		RD		PAY RCD	
070		SEL		902	
080		TRS		902 ERR	
090					Normal Routine
100	902 ERR	SEL		200	
110		BSP			
120		RSU		(-1)	
130		ST		(-1)	
140		TRP		RD RCD	
150		HLT		1111	
160		TR		INITIAL	
170				<u> </u>	
180					
190			_	<u> </u>	· · · · · · · · · · · · · · · · · · ·
200					
210					
220					
230					
240					
250					

PROBLEM 39. WRITE AND ERASE (AUTOCODER SOLUTION)

LINE	TAG	OPERATION	NUM.	OPERAND	COMMENTS
008		SET	4	4	
009		SET	2	2	
010		SET	15	20	
019		SET	1	1	
020	BEGIN RT	SEL		200	
021		RD		INPUT RCD	
022		LOD	1	(.)	
030		UNL	1	PSALES -2	
031		LOD	1	(‡)	
032		UNL	1	GM	
040		RAD		ISALES	
050		SPR		PSALES +1	
060		RCV	15	PSALESMAN	
070		TMT	15	ISALESMAN	
080		LOD	4	ISTATE	State & district
090		CMP	4	(0000)	Previous district & state
100		TRE		PRINT	Same district & state
110		TRH		NEW STATE	
120		HLT		1111	Error
130	NEW STATE	LOD	2	ISTATE	
140		UNL	2	(0000)	
150		UNL	2	PSTATE	
160		LOD	2	IDISTR	
170		CMP	2	(0000) -2	Previous district
180		TRE		PRINT	Same district
190		UNL	2	(0000) -2	District
200		UNL	2	PDISTR	
210	PRINT	SEL		400	
220	OFLOW	WRE		PRINT RCD	
230		TR		BEGIN RT	
010	INPUT RCD	DRCD			
020	IDISTR		2		
030	ISTATE		2	•	
040	ISALESMAN		20		
050	ISALES		7		
060	PRINT RCD	DRCD			
069	CTRL CHAR		1		
070	PDISTR		2		
080			3		
090	PSTATE		2		
100			3		
110	PSALESMAN		20		
120			3		
130	PSALES		8		
140		<u> </u>	1		
150	GM	<u> </u>	1		

PROBLEM 40. CARRIAGE CONTROL (AUTOCODER SOLUTION)

LINE	TAG	OPERATION	NUM.	OPERAND	COMMENTS
011		RAD	5	(+0)	
012		RAD	6	(+1)	
201		UNL	5	CTRL CHAR	For double space
211		TRS		CARCON	
240	CARCON	UNL	6	CTRL CHAR	For skipping
250		IOF			
260		TR		OFLOW	

PROBLEM 41. NORMALIZE AND TRANSFER (AUTOCODER SOLUTION)

LINE	TAG	OPERATION	NUM.	OPERAND	COMMENTS
009		SET	1	1	
010		LOD	1	(\$)	
020		UNL	1	OUTPUT -8	
030		LOD	1	(.)	
040		UNL	1	OUTPUT -3	
050		LOD	1	(*)	
060		RAD	7	(+0001)	
070		SET		4	
080		LOD		ADDR \$	Restore control
090		UNL		CALC ADDR	
100		SET	6	6	
110		LOD	6	INPUT	
120	NORMALIZE	NTR	6	ADDR ADJ	
130	PRINT	SPR	6	OUTPUT	
131		TR			Continue Main Routine
140	ADDR ADJ	ADM.	7	CALC ADDR	
150		LOD		CALC ADDR	Adjusted * address
160		UNL		PLACE ADJ	
170	PLACE ADJ	UNL	1		
180		CMP		CTRL ADDR	
190		TRE		PRINT	
200		TR		NORMALIZE	
210	ADDR \$	LACON	1	OUTPUT	
220	ADDR *	LACON		OUTPUT +4	
230		DCON			
240	CALC ADDR		4	0000	
250	INPUT	DRCD	6		
260	OUTPUT	DRCD	9		